

REMARKS

Claims 10-29 are pending in the application.

The drawings have been objected to under 37 CFR 1.83(a) because the examiner states that the “guide gap between the two valve elements” and “a chamber” recited in claims 25-28 are not shown in the drawings.

Applicant finds that the specification describes the guide gap 23 in paragraphs [0027] and [0040], and Figs. 1 and 2 clearly show the guide gap 23. Further, the description of the guide gap 23 relative to the chamber is described in paragraphs [0017] and [0040] and clearly shown in the drawings. Claims 25-28 have been amended to clarify which chamber is intended by the invention. Withdrawal of the objection is respectfully requested.

Claims 25-28 have been rejected under 35 USC 112, first paragraph as being nonenabling because the “guide gap between the two valve elements” and the “chamber” are not described in the specification in an enabling manner. However, these elements are described in the specification as indicated above, and due to the amendment to claims 25-28, withdrawal of the rejection is respectfully requested.

Reconsideration of the rejection of claims 10-29 under 35 USC 112, second paragraph is respectfully requested.

The claims have been amended to correct for the use of narrative and functional language. The structural arrangement of the elements of the invention have been clearly and positively recited in order to particularly point out and distinctly claim the subject matter regarded as the invention.

Reconsideration of the rejection of claims 10 and 17-28 under 35 USC 102(b) as being anticipated by DE 101 55 227 to Boecking is respectfully requested.

The claims are directed to a fuel injection device, for an internal combustion engine with direct fuel injection, having a housing and at least two valve elements comprising:

an inner valve element and an outer valve element inserted coaxially to one another into the housing;

at least one first fuel outlet opening disposed in the housing and associated with the outer valve element;

at least one second fuel outlet opening disposed in the housing and associated with the inner valve element;

a valve seat disposed in the housing which valve seat is engaged and disengaged with the inner valve element and the outer valve element to open and close the associated fuel outlet openings from a high-pressure fuel connection;

a first sealing region cooperating with the valve seat and disposed on the outer valve element in a location radially outward from the at least one first fuel outlet opening; and

a second sealing region cooperating with the valve seat and disposed on the outer valve element between the at least one first fuel outlet opening and the inner valve element.

Newly amended independent claim 11 includes the features of previous claim 10, wherein the first sealing region is embodied by a sealing edge of a first annular groove extending around the outer valve element, and wherein the first groove has an approximately semicircular cross-section and wherein at least a portion of the semicircular cross-section of the groove is located generally opposing the at least one first fuel opening.

Boecking discloses outer valve element 5, inner valve element 7, fuel openings 12, 14, first sealing region 32, valve seat 10, high pressure connection 16, second sealing region 30, annular protuberance 30, and groove 6. The examiner apparently relies on a space at the down stream tip of the outer element 5 near frusto conical area 207 to represent the guide gap between valve elements.

Boecking fails to disclose the first sealing region according to the invention embodied by a sealing edge of a first annular groove extending around the outer valve element, wherein the first groove has an approximately semicircular cross-section and wherein at least a portion of the semicircular cross-section of the groove is located generally opposing the at least one first fuel opening. This feature alone distinguishes the invention over Boecking.

Furthermore, Boecking lacks having deep grooves 68, 80 according to the invention and does not expressly show a plurality of grooves 74. Boecking does not appear to expressly show a guide gap 23 as intended by the invention connected to a control chamber 62. As such the combination of the sealing region 64 on the edge of deep groove 68 with the groove 74 or a plurality of grooves 74 extending from groove 68 to additional sealing region 72 is not anticipated by Boecking (subject matter of claims 13-16, not addressed by examiner). The second sealing region 72 at annular protuberance 70 being on the edge of deep groove 80 is not anticipated by Boecking (subject matter of claims 17-21).

Therefore, it is respectfully requested that the rejection be withdrawn and the claims be allowed.

Reconsideration of the rejection of claims 11 and 29 under 35 USC 103(a) as being unpatentable over DE 101 55 227 to Boecking is respectfully requested.

Newly amended claim 10 includes the feature of previous claim 11, wherein a gap initially exists following initial assembly of the device, between the second sealing region and the valve seat there-opposing with the outer valve element in a closed position, wherein the gap is preferably approximately 1 to 2 μm .

The Boecking-reference (DE 101 55 227 A1) discloses in column 4. lines 1-23, only to provide an inner sealing edge 30 on an elastically deformable protrusion 25 that comes into contact with valve seat 10 when outer valve element 5 closes. Boecking does not disclose to initially provide a clearance between valve edge 30 and valve seat 10. The elastically deformable protrusion would not be necessary if the device of Boecking did provide the initial gap of the invention, therefore this feature would teach away from the device of Boecking.

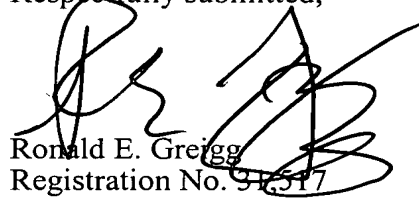
The advantage of the initial clearance is a considerable reduction of the manufacturing costs, since there is no high precision necessary when the sealing edge and the valve seat are manufactured. Instead, the optimum sealing is achieved only during initial operation of the fuel injection device by the initial deformation and the initial wear of first sealing edge 64 and the valve seat associated therewith.

Please note that these advantages are clearly disclosed in the specification in paragraph [0011]. By consequence, it would not have been obvious to modify the device of Boecking to obtain the invention as specified in amended claims 10 and 29. One skilled in the art does not find any suggestion for attaining the recited requirements and objects of the invention. Therefore, withdrawal of the rejection and allowance of the claims is respectfully requested.

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Entry of the amendment and allowance of the claims is respectfully solicited.

Respectfully submitted,



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